Fuel Cell Life Cycle

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International Fuel Cells (IFC) has delivered over 200 PC 25 fuel cell power plants around the world. These units have been installed on 5 Continents and have accumulated over 4 million operating hours. Each power plant saves, in one year of operation, over 40,000 pounds of air pollutants and 2 million pounds of CO2, compared to the average US fossil fueled generating plant. IFC is a division of United Technologies Corporation, a diversified manufacturer with $26.6 billion in sales. UTC is committed to establishing a leadership position in protecting the natural environment.

This presentation will review the status of the commercial power plants as well as discuss the methods by which IFC manufactures and disposes of units that have reached the end of their useful life. Included in this discussion will be the methods of disposal, which IFC utilizes, as well as a quantitative assessment of the amount of material recycled and disposed of by other methods. Included in this presentation will be:

- Typical applications of the PC 25 fuel cell power plant
- The field performance of these units
- The amount of air emissions and CO2 "saved" by operation of each PC 25
- Description of the various subsystems of a PC 25 fuel cell power plant and a description of the functionality of each of those subsystems
- A weight "breakdown" of those subsystems
- The disassembly sequence for the PC 25 at the end of its useful life
- The disposition of the various materials in the power plant
- A weight breakdown of certain materials within the PC 25
- The disposition of the materials within the PC 25at the end of its useful life
- The disposition of the power plants consumables during its operation
- A discussion of UTC's Supplier Assessment program

The objective of the presentation is to illustrate how a screening LCA study is used to identify the significant aspects and impacts of the product system. Qualitative risk assessments based on the judgement of experienced cross- functional teams can help prioritize improvement actions. These studies also identify key business trade- offs early in the design process. There is limited experience with decommissioning fuel cells, and these studies are critical to developing competitive systems for end of life (EOL) processing. The qualitative LCA approach was used to assure key environmental issues are properly addressed. The overriding goals has been to assure no improper release of hazardous materials to the environment. A key question that remains to be answered is how much EOL processing for reuse/ recycle is economically feasible. Future work will address more comprehensive LCA modeling to validate proposed improvement concepts and various EOL schemes.

The presentation will also address the larger issues of life cycle management from the UTC perspective.. An emerging trend toward product- focused EH&S management requires consideration of the reverse logistics of collection, recycle/ reuse and ultimate

disposal. There is also a growing public concern over release of hazardous materials into the environment. Consumers expect companies to track and report usage of various materials of concern. UTC has promulgated new policies for design for environment and new goals to accelerate substitution of potentially hazardous materials of concern. These programs create additional challenges for supply chain management. An overview of these UTC programs will be provided.